אוניברסיטת חיפה
UNIVERSITY OF HAIFA
جامعة حيفا

THE FACULTY OF NATURAL SCIENCES LAB COMPLEX

BREAKTHROUGHS BEGIN HERE

FEBRUARY, 2025

The University of Haifa is embarking on a pioneering initiative to establish a state-of-the-art laboratory complex in its Faculty of Natural Sciences. This new facility will address the growing need for advanced research spaces to support groundbreaking work in life sciences. The complex will invest in three research areas where we have the recognized expertise to lead globally:

- **Evolutionary and Environmental Biology,** advancing knowledge of ecosystems, biodiversity, and their delicate interconnections
- **Biology and Medical Sciences,** translating discoveries into innovative approaches for health, disease prevention, and treatment
- **Neuroscience,** uncovering the mechanisms of brain function and its influence on human behavior and mental health

The new laboratories will serve as a hub for innovation and interdisciplinary collaboration. This investment will amplify University of Haifa's global impact, attract top talent, drive scientific breakthroughs, and address critical challenges in health and environmental sustainability.

This brochure offers a glimpse into our research agenda and educational activities, introduces you to a few of our exceptional researchers, and highlights the positive impact an investment in these new labs will have on northern Israel and the country.

WELCOME MESSAGE

Dear Friends and Supporters,

At this watershed moment in Israel's history, in the wake of an unprecedented war and facing complex societal challenges, scientific innovation represents far more than academic progress—it is a profound expression of our national resilience and hopes for a brighter future. At the University of Haifa, we are committed to pushing the boundaries of knowledge and developing breakthrough solutions that will not just shape that future, but fundamentally transform it. Every discovery emerging from our laboratories will be a shared victory—a testament to our collective spirit and potential.

Perched on the scenic Mount Carmel mountain range, nestled within the vibrant city of Haifa and hugging the Mediterranean coast, the University of Haifa occupies a geographical trifecta that is both rare and remarkable. The convergence of mountain, city, and sea at our doorstep isn't just geography—it's opportunity.

Our planned state-of-the-art facilities for the Faculty of Natural Sciences will harness this unique environment and produce discoveries that combine novel perspectives. From developing advanced climate models using our diverse ecosystems to creating innovative cancer and neurobiology therapies inspired by marine organisms, the possibilities are endless.

To you, our cherished friends and supporters, your unwavering belief in science's transformative power is the driving force behind our mission. By supporting this crucial initiative, you are not just fueling research; you are rekindling the spirit of northern Israel and creating a legacy of innovation that will resonate for generations.

Together, we are writing a new chapter in the story of scientific discovery, one that will shape the future of our region and beyond.

Sincerely,

Prof. Gur Alroey

President

Prof. Mouna Maroun

Rector

MESSAGE FROM DEAN

Prof. Ofir Alon

At the Faculty of Natural Sciences, our scientists are ready to lead the next wave of breakthroughs. However, innovation demands more than great ideas. To achieve our vision, we need cutting-edge laboratories that will fuel new discoveries, push the boundaries of life science research and yield returns that go beyond traditional metrics. A new state-of-the art laboratory complex will enable us to generate life-saving medical treatments, pioneer sustainable farming practices, and produce insights that reshape our understanding of life itself, ultimately laying the groundwork for a brighter future for humanity.

Faculty Mission Statement

The Faculty of Natural Sciences bridges life and exact sciences to confront global challenges with bold, boundary-pushing research. By fostering collaboration and inspiring creativity, we empower students to take leadership roles in industry, education, and academia that will shape a brighter, more sustainable future.

At the Faculty of Natural Sciences, we are committed to building that future. Our academic program is undergoing a remarkable transformation, marked by exponential growth in both scope and influence. Three pioneering departments—neurobiology, human biology, and evolutionary and environmental biology—form the core of our life sciences research agenda. Popular double-major programs, ranging from biology-medical sciences to biology-philosophy, reflect our commitment to interdisciplinary education, while specialized biology sub-tracks in ecology, bioinformatics, and marine biology address emerging 21st century fields.

With student enrollment tripling in recent years, coupled with an influx of exceptional young scientists, our faculty stands at a pivotal moment. In 2024, an international committee of experts convened by the Israeli Council for Higher Education recognized the University's Faculty of Natural Science's vital role in advancing life sciences education and research in northern Israel. The committee members further noted that a strategic investment in modern labs and equipment could elevate our faculty to international prominence.

Your support will provide our researchers with the environment and resources needed to unlock the science that will define tomorrow. Partner with us to turn this vision into reality.

STRATEGIC EXCELLENCE:

THE NEED FOR NEW LABORATORIES AND IMPACT ON BREAKTHROUGH DISCOVERIES

"One never knows what remains undiscovered simply because the right equipment is not there at the right time."

Arthur L. Schawlow,
1981 Nobel Prize Laureate

Research Fields of the Future

Biogerontology - explores the biological and molecular mechanisms of aging to develop interventions that promote healthy aging and extend lifespan.

Biophysics - uses the principles of physics to understand biological processes, leading to advancements in medicine, biotechnology, and our fundamental understanding of life itself.

Synthetic Biology - bridges biology and engineering to create sustainable, innovative solutions that reshape industries and advance biotechnological capabilities across medicine, environment, and agriculture.

We believe that strategic focus is essential for pioneering breakthroughs. We concentrate our efforts on key areas where we have the experts and resources and lead globally: Evolutionary and Environmental Biology, Neuroscience, and specialized fields within Human Biology. This targeted approach allows us to optimize our resource use and forge strategic academic partnerships that accelerate scientific discovery.

Human Biology – Professors Sarit Larisch, Dalit Barkan, and Amiram Ariel conduct internationally recognized research into cellular processes central to cancer and inflammation. While their individual focuses include cell death in cancer (Larisch), breast cancer metastasis (Barkan), and inflammation resolution (Ariel), their work converges on key areas: cell death and survival pathways, cancer biology, and molecular signaling. Together with the soon-to-be-established school of medicine, new laboratories will strengthen collaboration, provide space for advanced equipment and accelerate the pace of life-saving discoveries.

Neuroscience – In recent years, the University of Haifa has made significant strides in unraveling the complexities of neurological and psychiatric disorders. By examining the intersection of behavior and neural mechanisms through methods ranging from molecular biology to human imaging, our researchers have developed innovative treatments for conditions like Alzheimer's, Parkinson's, stroke, and depression. But the path to curing these challenging disorders requires ongoing interdisciplinary collaboration and access to cutting-edge facilities that bring researchers together under one roof.

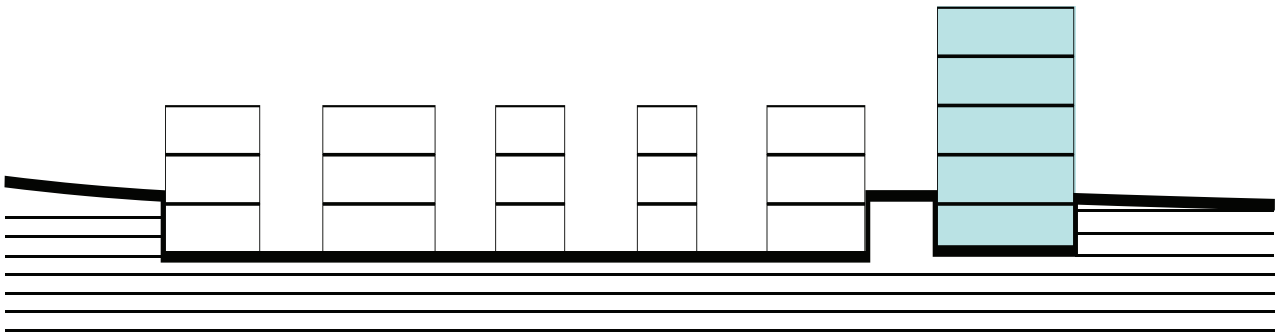
Evolutionary and Environmental Biology – Mount Carmel provides an ideal setting for our Department of Evolutionary and Environmental Biology, where leading researchers and students from around the world converge to study ecology and evolution. Our research addresses critical global challenges, from food security and genetic diseases to the impacts of climate change on plant and animal life. These studies are increasingly powered by advanced bioinformatics, which enables the analysis of complex biological data at unprecedented scales.

THE FACULTY OF NATURAL SCIENCES LABORATORY COMPLEX

A new five-story Laboratory Complex for the Faculty of Natural Sciences will provide much-needed advanced research space. The complex will house over 20 state-of-the-art labs dedicated to key life science fields, including neurobiology, genetics, synthetic biology, and the study of aging and longevity. Each lab will support a collaboration between 8-10 students, faculty, and technical staff, fostering shared hands-on learning. This collaborative environment will be crucial as our research agenda expands and our student body grows from the current 830 to approximately 1,250 students. Located in the basement, a pre-clinical research unit equipped for advanced imaging and gene editing techniques will enable researchers to conduct precise studies that advance our understanding of disease and inform the development of novel therapies.

University researchers will gain access to specialized research services, high-precision equipment, and expert support through the Shared Research Center, located on the ground floor. A key mission of the Shared Research Center is to support interdisciplinary research by providing capabilities beyond the reach of individual labs. These resources will assist researchers at every step, from experimental design and sample preparation to advanced imaging and data analysis. The Shared Research Center will include:

- **Bioimaging Unit:** High-resolution microscopy and advanced visual analysis technologies.
- **Flow Cytometry Unit:** Sophisticated cellular analysis and sorting capabilities.
- **Bioinformatics Unit:** Computational tools and data interpretation services.
- **Histology Unit:** Tissue preparation, staining, and microscopic examination.
- **Genomics Unit:** Genetic sequencing and molecular research technologies.



*For visualization purposes only.

TINY BRAIN MODELS, BIG SCIENTIFIC DISCOVERIES:

HOW ONE SCIENTIST IS CHANGING NEUROLOGY

Prof. Shani Stern

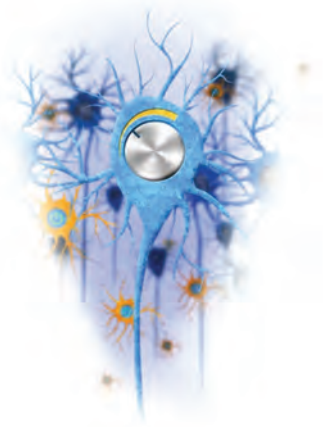
After ten years in Israel's booming tech industry, Shani Stern made a dramatic shift. She packed up her four children and supportive husband, moved to San Diego, squeezed everyone into a one-bedroom apartment, and dove head first into neuroscience research. "Electrical engineering felt like a cage," Stern recalls. "It paid well, but my mind wasn't engaged." Today, Prof. Stern leads the Lab for Precision Disease Modeling at the Faculty of Natural Sciences, where her team is doing something extraordinary – growing miniature brains.

These aren't full-sized brains, of course, but "brain organoids" – tiny, three-dimensional structures grown from patients' own blood stem cells. These organoids mimic the intricate workings of the human brain, offering a unique window into neurological disorders like autism, bipolar disorder, schizophrenia, and Parkinson's disease, and paving the way for personalized treatments.

Stern's approach is both innovative and precise. It begins with a simple blood sample. From these cells, Stern's team creates induced pluripotent stem cells – cells that can transform into any cell type in the body. They then coax these stem cells to become neurons, creating lab-grown brain cells that carry the patient's exact genetic blueprint. This approach allows researchers to study the specific mechanisms of a patient's disorder in unprecedented detail and provides a powerful new platform for testing potential treatments.

In a groundbreaking fusion of biology and technology, Stern's lab is tackling Parkinson's disease by targeting the extracellular matrix (ECM), the brain's essential scaffolding that supports cell communication and function. Her team has revealed a critical link between Parkinson's and disruptions in ECM-related genes, shedding light on how these changes drive the disease. By building neural networks from patient blood samples and applying advanced 3D modeling and algorithms, they can detect early indicators of Parkinson's before subtle resting tremors manifest.

Stern's work isn't just about understanding the brain; it's about transforming lives. By identifying biomarkers for improved diagnosis and developing targeted treatments, she is laying the groundwork for precision medicine in neurology. This research offers real hope for disorders that have long baffled scientists and left patients with limited options. Stern's groundbreaking research is bringing us closer to a time when neurological and psychiatric disorders are no longer mysteries, but manageable conditions.



Imagine: a nano-device designed to unlock and rewrite memories.

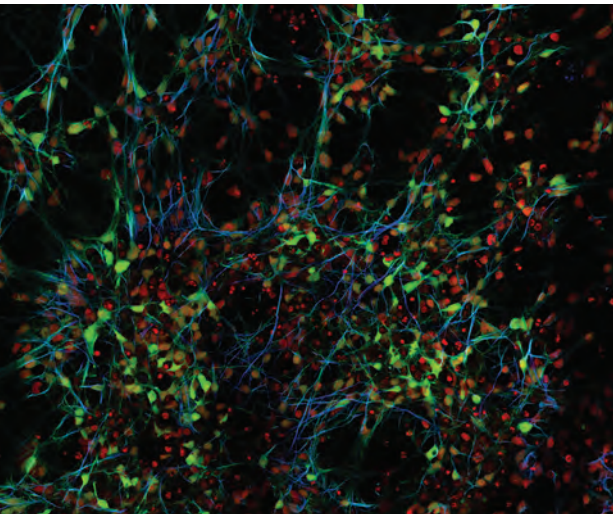
PRECISION NEUROSCIENCE:

THE FUTURE OF TREATING NEUROLOGICAL AND NEURODEGENERATIVE DISEASES

Prof. Eran Stark

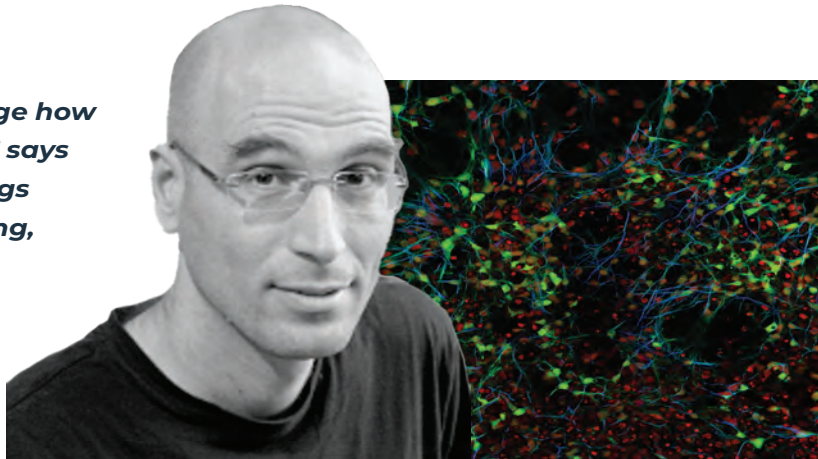
Prof. Eran Stark is rewriting our understanding of how the human brain works, one neuron at a time. Employing pioneering methods, the Stark Lab can now manipulate individual neurons in a living brain with unprecedented precision. This transformative research is not just pushing the boundaries of neuroscience; it's paving the way for a new era of personalized medicine and offering hope for previously untreatable conditions.

With over 3 billion people worldwide struggling with memory disorders and other neurological conditions, the implications of this research are far-reaching. Using advanced tools to precisely target and control neurons in living brains, the lab can effectively "write" memories by stimulating specific neural pathways and "erase" them by disrupting those same connections.



The lab's multidisciplinary team – combining experts in medicine, chemical engineering, physics, and molecular biology – is on the cusp of unlocking the mysteries of how memories are formed, stored, and retrieved. **Their work is opening exciting new avenues for treating memory-related disorders and holds the potential to translate brain signals into digital commands.** This breakthrough could empower individuals with paralysis to control external devices using only their thoughts, restore communication for those who have lost the ability to speak and detect early signs of neurological disorders long before visible symptoms appear.

"Our goal is to fundamentally change how we approach neurological disease," says Prof. Eran Stark. "This research brings us closer to a future of understanding, treating, and ultimately preventing these devastating conditions."



Renad Jabarin, PhD Candidate

The Lab for Neurobiology of Social Behavior

My name is Renad Jabarin. I am a 29-year-old first-generation university graduate from the nearby village of Zalafa. Over the past eight years, I earned my bachelor's and master's degrees at the University of Haifa and am now completing my PhD in Prof. Shlomo Wagner's Lab for Neurobiology of Social Behavior. My research investigates how neurons in the medial prefrontal cortex, a brain region associated with social behavior and emotions, respond to social cues. With five published papers and a sixth forthcoming, I am deeply grateful for the support and opportunities provided by the University community.

COMMUNITY OUTREACH

STRENGTHENING NORTHERN ISRAEL

The Faculty of Natural Sciences is on a mission to transform lives and strengthen communities across northern Israel following the war in the north. In the aftermath of the conflict, northern communities face disrupted education systems and growing inequality, particularly among vulnerable populations. Through fun, hands-on educational initiatives, the Faculty brings the wonders of science to the region's youth, with a special focus on empowering students from minority and disadvantaged backgrounds. These programs are not just lessons – they are lifelines, creating pathways to a better future for individuals and the region as a whole.

The Biology Exploration Program, in collaboration with the Department of Biology, has engaged hundreds of high school students from grades 7 to 12, representing dozens of schools in Haifa, the Western Galilee and the Carmel coastal communities.

A two-day biology workshop had a profound impact on female students from the nearby Arab village of Umm al-Fahm, inspiring them to pursue higher education in the sciences. Dr. Meirav Avital-Shacham, Educational Outreach Coordinator for the faculty, shared a particularly endearing exchange: "Their eyes lit up when they looked through the microscopes." The experience proved so motivating that the students expressed a desire to return: "They told me that the experience motivated them to come back after high school and study life sciences at the University of Haifa."

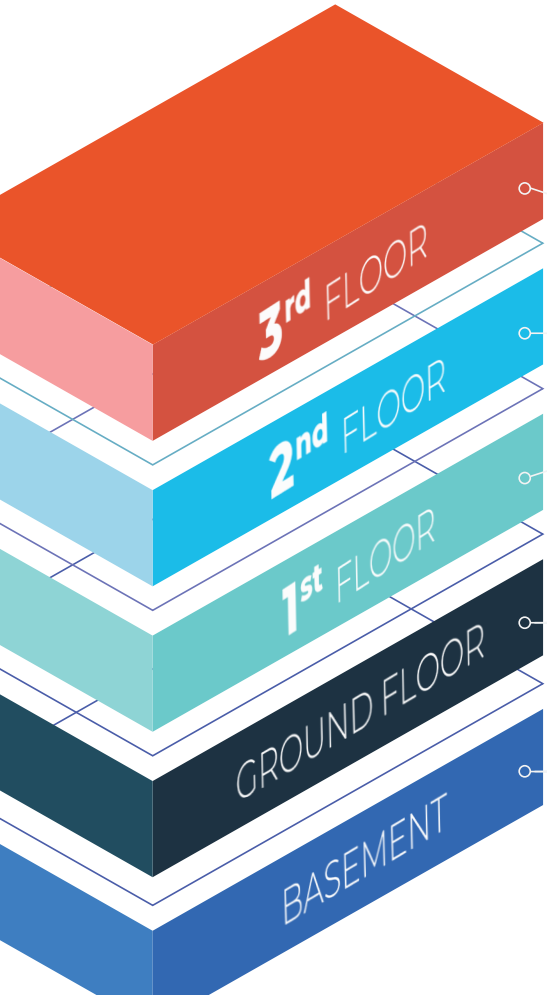
The 'Kodkod' (Vertex) Math Program, a unique four-year initiative by the Department of Mathematics, enables exceptional high school students from across the North to pursue a bachelor's degree in mathematics alongside their regular studies. It prepares these talented young scholars for meaningful future professions and military roles, including artificial intelligence, mathematical modeling, computer science, bioinformatics, and neuroscience.

THE FACULTY OF NATURAL SCIENCES LABORATORY COMPLEX

BREAKTHROUGHS BEGIN HERE

BUILT UP AREA: APPROX. 82,000 SQ FT. (7,600 SQ. M.)

FOUR FLOORS AND BASEMENT



Laboratories
Conference Rooms
Technical Rooms

Shared Resource Center
Seminar Rooms
Cafeteria

Pre-Clinical Research Unit

FOR YOUR CONSIDERATION

We invite you to partner with us in establishing a state-of-the-art facility that will empower scientists at the Faculty of Natural Sciences to drive breakthroughs in health, sustainable farming and environmental sustainability with far-reaching regional and global impact. This landmark investment will enable the University to attract top talent, expand outreach programs to inspire Israel's next generation of scientists, and position Haifa and Northern Israel as leaders in life sciences. Together, we can transform research into innovative solutions that improve lives worldwide.

- **A landmark naming contribution of $57 million will enable the University of Haifa to establish a state-of-the-art, five-story laboratory complex.**

Join us in building the new Faculty of Natural Sciences Laboratory Complex, where your generous donation will empower groundbreaking research and innovation. By partnering with us, you will play a vital role in shaping the next generation of scientists who will address critical challenges facing Israel and the world. Together, we can strengthen our community and enhance our capacity for transformative discoveries that benefit society.

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